



1 A. TITLE OF THE INVENTION

2 EMULSIFIED LIQUID SHORTENING COMPOSITIONS COMPRISING DIETARY FIBER
3 GEL, WATER AND LIPID.

4 B. CROSS-REFERENCE TO RELATED APPLICATIONS

5 Not Applicable

6 C. STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH/DEVELOPMENT

7 The present invention does not involve any form of federally sponsored research or
8 development.

9 D. BACKGROUND OF THE INVENTION

10 The present invention relates to emulsified liquid shortening compositions comprising dietary
11 fiber gel, water and lipid. Recent media attention to the global problem of obesity demonstrates a
12 need for greater availability of functional and delicious foods with low caloric and fat content.
13 Another development in recent health science indicates that an increase in consumption of dietary
14 fiber can have significant health benefits such as decreasing blood cholesterol levels, reduction of
15 colon cancer risk and improving digestive tract health and functioning.

16 In recent years, some companies have begun to offer reduced fat foods. Reduction of fat
17 content of foods, however, generally has an adverse effect on the taste and texture of these foods.
18 Reducing the fat content, for example, can result in gritty textures and dry consistencies and even the
19 addition of an unpalatable "chemical" type taste to an otherwise delicious food. As a result, the
20 consuming public faces the choice of eating delicious, yet high in fat food, or eating healthier food
21 they don't enjoy.

22 The absence of a means to reduce the fat content of foods while still producing desirably
23 flavored and textured foods presents an unmet need in today's food and beverage industry.

24 E. BRIEF SUMMARY OF THE INVENTION

25 It is an object of the present invention to answer this unmet need by providing a unique
26 composition of matter embodied by emulsified liquid shortening compositions comprising dietary
27 fiber gel for calorie reduced foods, water and fat or oil (herein the fat and oil component is referred
28 to as "lipid"; the compositions are referred to as "emulsified compositions"). One or more of the
29 following functional foods can be added to the composition: high omega three and omega six oils
30 and pure omega three and omega six fatty acids, medium chain triglyceride, beta carotene, calcium
31 estearate, vitamin E, bioflavonoids, fagopyritrol, polyphenolic antioxidants of vegetable origin,
32 lycopene, luteine and soluble fiber, for example Beta-Glucan derived from yeast, and other soluble
33 fibers derived from grain, flax seed, and other vegetable and fruit fiber sources. This emulsified
34 composition can be used as a substitute for traditionally used fats, oils and liquid shortenings. This
35 emulsified composition can also be used on a prorated basis as a vector for the introduction of
36 dietary fiber gels into formulated foods to partially and totally replace other hydrocolloids normally
37 found in formulated foods, thus providing an effective means to reduce production costs of
38 formulated foods. It is another object of the present invention to provide a method of producing said
39 emulsified compositions.

40 Dietary fiber gel for calorie reduced foods holds the key to meeting this need. Dietary fiber
41 gel for calorie reduced foods (hereinafter, "dietary fiber gel") is fully described in U.S. Patent
42 number 5,766,662 (the '662 patent). This dietary fiber gel comprises insoluble dietary fibers
43 consisting of morphologically disintegrated cellular structures, and is characterized by their ability to
44 retain large amounts of water. This dietary fiber gel is produced by shearing agricultural by-
45 products, such as seed brans, hulls, and so forth, under alkaline conditions. Dietary fiber gel in a
46 hydrated form can exist as a gel, and in the dehydrated form as flakes and powders. Additionally,
47 this dietary fiber gel is characterized by its high viscosity at low solid levels. Other insoluble fibers
48 consist of morphologically intact cellular structures, and thus impart a gritty texture to the foods in

49 which they are contained. The dietary fiber gel disclosed in the '662 patent, however, consists of
50 morphologically disintegrated cellular structures and thus impart a smoother texture than other
51 insoluble fiber formulations. A physically smooth morphology is readily revealed under electron
52 microscopic magnification of the dietary fiber gel. Without being bound by any specific theory, it is
53 believed that the smooth morphology reflects an amorphous nature of the insoluble compounds that
54 constitute dietary fiber gel.

55 According to the present invention, dietary fiber gel can be subjected to micro-particulation
56 by high shear via homogenization and combined with water and lipid. The resultant product can
57 then be subjected to colloid milling or other equivalent methods of emulsification, for example
58 homogenization and ultrasonification treatment, in the presence of food grade emulsifiers, for
59 example lecithin, and the emulsified mixture can be pasteurized. Functional foods, including, but
60 not limited to, high omega three and omega six oils and pure omega three and omega six fatty acids,
61 medium chain triglyceride, beta carotene, calcium estearate, vitamin E, bioflavonoids, fagopyritrol,
62 polyphenolic antioxidants of vegetable origin, lycopene, luteine and soluble fiber, for example Beta-
63 Glucan derived from yeast, and other soluble fibers derived from grain, flax seed, and other
64 vegetable and fruit fiber sources can be added for further health benefits. The resultant
65 compositions, as well as the method of producing them, are the subject of this invention.

66 Further objects, advantages and features of the present invention will present themselves in
67 the following detailed description.

68 F. DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

69 This invention is directed to emulsified liquid shortening compositions comprising dietary
70 fiber gel, water and lipid, as well as a method for making the same.

71 DESCRIPTION OF THE EMULSIFIED COMPOSITION

72 According to the present invention dietary fiber gel can be provided in combination with
73 water and a lipid component, the combination being an emulsified composition of matter comprising

74 dietary fiber gel, water and lipid. This composition of matter can be pasteurized. Other ingredients,
75 most notably functional foods such as high omega three and omega six oils and pure omega three
76 and omega six fatty acids, medium chain triglyceride, beta carotene, calcium estearate, vitamin E,
77 bioflavonoids, fagopyritrol, polyphenolic antioxidants of vegetable origin, lycopene, luteine and
78 soluble fiber, for example Beta-Glucan derived from yeast, and other soluble fibers derived from
79 grain, flax seed, and other vegetable and fruit fiber sources can be added.

80 Water content of the composition can be in the range of 30 percent to 80 percent by weight.

81 Dietary fiber gel concentrations can range from 0.3 percent to 20 percent by weight. The dietary
82 fiber gel can be the product of the '662 patent, and can be a cellulose hydrolyzed version thereof.

83 The remainder of the composition comprises lipid, including fats, oils and liquid shortenings, and if
84 included, a functional food and some combination of functional foods to be further described infra.

85 The lipid component can comprise any oleic fatty acids, flax seed oil, olive oil, canola oil,
86 corn oil, walnut oil, peanut oil, and any other vegetable oil, and any combination thereof.

87 Functional foods can be added to the composition to increase the health benefits of prepared
88 foods comprising the emulsified liquid shortening compositions comprising dietary fiber gel for
89 calorie reduced foods, water and lipid. The following functional foods and their respective ranges
90 are given by way of example, but other functional foods, notably fat soluble functional foods, can be
91 added as well. High omega three oils and omega six oils, for example flax seed oil, can be added in
92 concentrations of 1 percent to 50 percent of the overall composition by weight. Pure omega three
93 fatty acids and omega six fatty acids can be added in concentrations ranging from 1 percent to 30
94 percent of the overall composition by weight. If both pure omega three fatty acids and high omega
95 three oils are used, their respective concentrations can be prorated to give an appropriate end
96 concentration of high omega three fatty acids. If both pure omega six fatty acids and high omega six
97 oils are used, their respective concentrations can be prorated to give an appropriate end
98 concentration of high omega six fatty acids. Medium chain triglyceride can be added in

99 concentrations ranging from 1 percent to 50 percent of the overall composition by weight.
100 Fagopyritrol can be added in concentrations of 0.25 percent to 20 percent of the overall composition
101 by weight. Polyphenolic antioxidants of vegetable origin, for example lycopene, beta carotene,
102 luteine, and bioflavonoids can be added in concentrations ranging from 0.25 percent to 20 percent of
103 the overall composition by weight. Soluble fiber, for example beta Glucan, can be added in
104 concentrations ranging from 5 percent to 15 percent of the overall composition by weight. Any
105 functional foods added to the composition can be added in such concentrations to deliver up to 100
106 percent, preferably 25 percent to 100 percent, of prevailing recommended daily intake
107 recommendations by the FDA, European Commission, FAO, Codex Alimentarius, or other
108 international authorities.

109 DESCRIPTION OF METHOD OF MAKING THE EMULSIFIED COMPOSITION

110 At a minimum, the emulsified composition comprises dietary fiber gel, water and lipid.
111 Other ingredients can be added, such as emulsifiers and functional foods.

112 Emulsifiers are well known in the art, and lecithin is an example of a commonly used
113 emulsifier. Other emulsifiers can be used. Dietary fiber gel is a hydrocolloid and as such has
114 emulsifier properties. Additional emulsifiers can be added on a prorated basis to augment the
115 emulsifier properties of the dietary fiber gel. Emulsifiers such as lecithin, if included, can preferably
116 be added in a concentration ranging from 0.2% to 10.0% so as to deliver a requisite amount of
117 choline, preferably in the range of 0.1 grams to 2.0 grams, per two ounce serving of formulated
118 foods comprising emulsified liquid shortening composition comprising dietary fiber gel for calorie
119 reduced foods, water and lipid.

120 Functional foods can include high omega three and omega six oils and pure omega three and
121 omega six fatty acids, medium chain triglyceride, beta carotene, calcium estearate, vitamin E,
122 bioflavonoids, fagopyritrol, polyphenolic antioxidants of vegetable origin, lycopene, luteine and
123 soluble fiber, for example beta-glucan derived from yeast, and other soluble fibers derived from

grain, flax seed, and other vegetable and fruit fiber sources. Other functional foods that offer health benefits, most notably those functional foods that are fat soluble, can be added as well.

According to the present invention, ingredients to be used are combined and mixed. At a minimum these ingredients comprise dietary fiber gel, water and lipid, but as stated above emulsifier or emulsifiers can be added, as can any of a number of functional foods and a combination thereof. In one preferred embodiment, the dietary fiber gel can be subjected to high shear micro-particulation by colloid milling, homogenization, ultrasonication and any other suitable means prior to combining the dietary fiber gel with the other ingredients. It is sufficient, however, that high shear micro-particulation occurs after the dietary fiber gel has been combined with any and all of the other ingredients.

The resultant mixture can be subjected to micro-particulation by high shear. Methods of micro-particulation can include homogenization and other methods that are well known in the art, such as colloid milling and ultrasonication treatment. In one preferred embodiment the mixture can be homogenized by subjecting it to high pressure, preferably in the range of 1500 pounds per square inch (psi) to 2500 psi, and elevated temperature, preferably in the range of 120 degrees Fahrenheit to 195 degrees Fahrenheit. The resultant product is an emulsified composition. Ideally, this emulsified composition can have fat droplet sizes in the range of 5 microns to 50 microns, but sizes outside this range are possible as well.

In a preferred embodiment, the emulsified composition can be pasteurized. The composition can subsequently be aseptically packaged.